5.4.14 Winter Storms

History

At least 111 winter storms affecting Arizona were identified between 1994 and 2007, which resulted in a total of 24 fatalities, 35 injuries, and approximately $2.1 million in reported damages. A disaster/emergency declaration made for 3 winter storms, during the same period. The following are some of the largest winter storms in Arizona's history:

- January 4, 1995, a winter storm caused heavy rains over much of central and southeastern Arizona, resulting in an estimated $2.0 million in damages. Reported rainfall included 3.5 inches at Magma, 2.33 inches at Payson, 2.08 inches at Pinetop, 2.01 inches at Globe, and 1.83 inches at Sedona. Some unbridged road crossings in the Safford area were also damaged (NCDC Storm Event Database, July 2007).
- January 1997, a winter storm created snowfall at unusually low elevations across southern Arizona. A trace of snow was recorded at Tucson, and 4 to 10 inches at elevations between 4,000 and 6,000 feet. The storm closed schools, stranded many motorists, caused broken water pipes, and caused the fatality of many ostriches at commercial farms, resulting in an estimated $100,000 in damages (NCDC Storm Event Database, July 2007).
- March 2000, a winter storm dropped between 1 and 1 1/2 inches of rain in the Tucson area, with nearby mountains receiving about 24 inches of snow. Temperatures hovered around freezing and approximately 500 illegal aliens surrendered themselves to nearby homes or passing motorists. Wearing only t-shirts and using plastics bags as rain gear they were treated for various stages of hypothermia and injuries they received while walking through the desert. Two fatalities and ten injuries from exposure were reported in an area 50 miles southwest of Tucson (NCDC Storm Event Database, July 2007).
- November 2001, the first storm of the season with measurable snow caused dozens of rush-hour traffic accidents along the Mogollon Rim, resulting in 1 fatality and 5 injuries. Most of the accidents occurred on Flagstaff City streets as the roads became snow packed and icy. City police handled more than 40 accident calls. County officials reported less than ten accidents. Jack-knifed semis caused east bound traffic on I-40 to come to a standstill 5 miles east of Williams. There was a fatal crash on I-40 three miles east of Seligman (NCDC Storm Event Database, July 2007).

Probability and Magnitude

Snow level measurements are recorded daily across the United States and can be used to estimate the probability and frequency of severe winter storms. In Arizona, there is a 5% annual chance that snow depths between zero and 25 centimeters will be exceeded, a snowfall probability that is among the lowest in the nation (FEMA, 1997). However, snowfall extremes can occur in Arizona and have serious effects.

Snowfall Records in Arizona			
Event	Amount	Date	Location
Record Maximum Winter Snowfall	400.9"	1972-73	Sunrise Mountain
Record Maximum 1-Day Snowfall	38.0"	14 December 1967	Heber Ranger Station
Highest Average Annual Snowfall	243.0"	--	Sunrise Mountain
Source: Office of the State Climatologist for Arizona, 2007.			

Map 34

The NCDC compiled snow climatology statistics using historic record data from statewide NWS cooperative observer site for 1948 to 1996. Each station in Arizona and the nearest stations in California, Nevada, Utah, Colorado, and New Mexico were queried from this data set to establish maps showing statistical projections of the 3-day 100-year snow depths. The resultant map can then be used to conceptually estimate potential snow depths for each of the recurrence intervals at locations within the state. Map 34 presents the results for the 3-day, 100-year events which would be considered worst case scenario.

Vulnerability

Winter snows are the lifeblood of water supplies for a large part of northern Arizona. However, according to the databases for northern Arizona, especially for Coconino County, winter storms are second most costly and deadly natural hazard to the area. Severe winter storms affect many aspects of life in the County, including; transportation, emergency services, utilities, agriculture and the supply of basic subsistence to isolated communities. Interstates 40 and 17 have produced numerous fatal multi-car accidents due to heavy winter snowfall and icy road conditions. Heavy snowfalls can also leave motorists stranded in their vehicles with potentially disastrous results like hypothermia and carbon-monoxide poisoning. Significant snowstorms can also hinder both ground and air emergency services vehicles from responding to accidents or other emergencies. Remote areas and communities

can be easily cut-off from basic resources such as food, water, electricity, and fuel for extended periods during a heavy storm. Extremely heavy snowstorms can produce excessive snowloads that can cause structural damage to under-designed buildings. Agricultural livestock can also be vulnerable to exposure and starvation during heavy snowstorms.

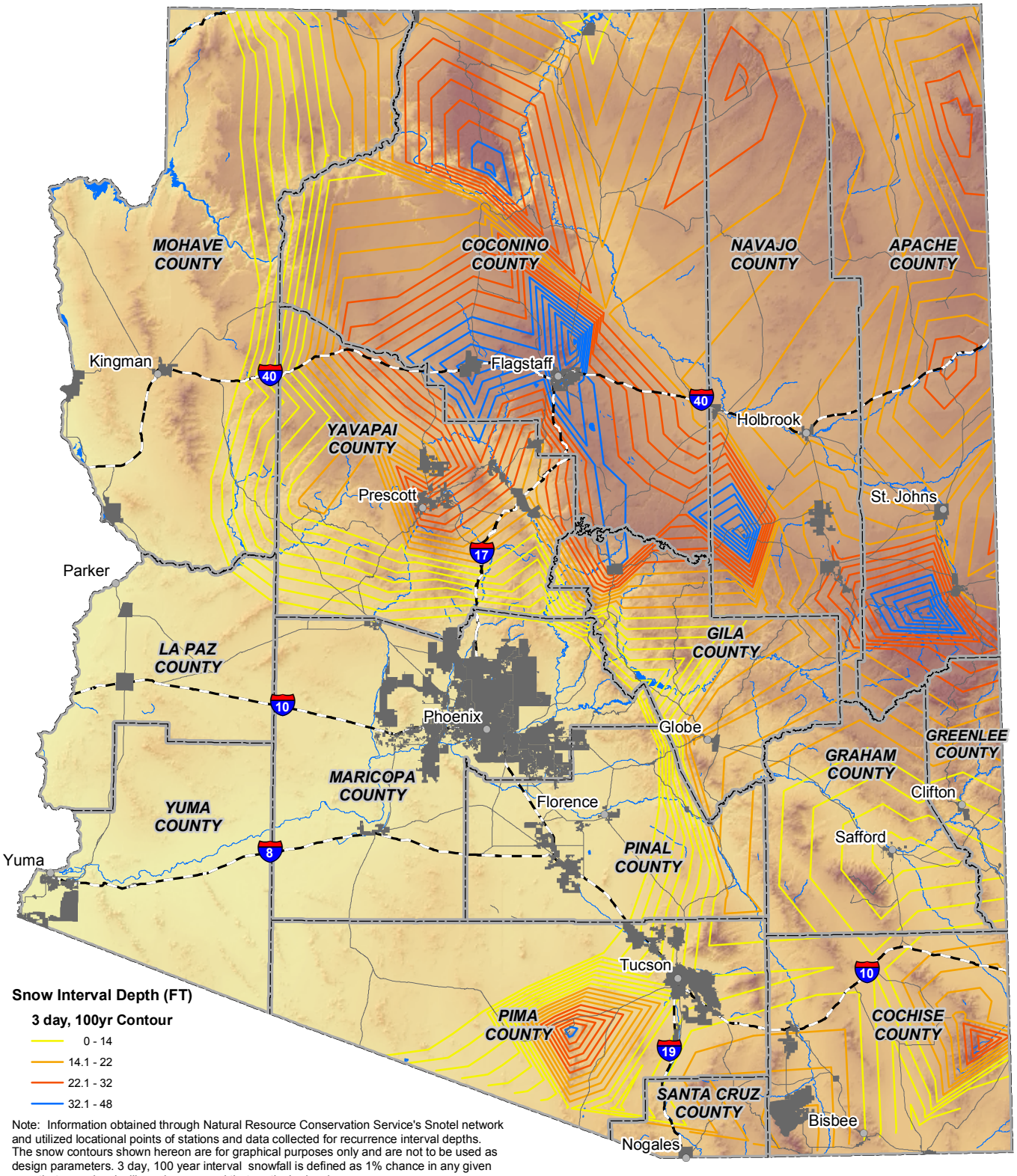
For the local risk assessment summary, the table below combines asset and predominantly HAZUS information for the estimated losses as reflected in local plans. The estimated losses for the hazard areas are approximately $500,000 for Coconino County only.

The following are highlights of the more prominent flooding events impacting Coconino County due to winter storms:

- December of 1967 to January of 1968, the worst winter storm to impact Coconino County occurred paralyzing most of northern Arizona and bringing snow to much of the State. There were actually two storms, with the second following closely on the heels of the first. During the nine day period, 86 inches of snow fell at Flagstaff. On December 14, a one-day State record of 38 inches fell at the Heber Ranger Station with reported totals of 91.5 inches at the Heber Ranger Station, 32.5 inches at Sedona, and 31 inches at the South Rim of the Grand Canyon. The Navajo Nation was extremely hard hit as two to three feet of snow fell across the community. Window Rock measured 33.5 inches. Heavy snows isolated Page and other northern communities for approximately two weeks. Most roads were closed and emergency food had to be airlifted to the communities. The total disaster cost to the State was $2.2 million in 1997 dollars. A total of eight people died of exposure. (ADEM, 2004).
- January of 1995, heavy snows and wind downed powerlines and caused a 60 foot tree to fall on a mobile home in the Flagstaff area. Storm related damages were estimated at over $50,000. (NCDC, 2003)
- January of 1997, a heavy winter storm moved through the northern part of the State dropping 34 inches of snow on the Flagstaff area and forcing the closure of Interstates 17 and 40. The total disaster cost to the State was $1.6 million in 1997 dollars (ADEM, 2004).

Summary of Local Risk Assessment & loss estimates based on Winter Storms			
	Total Assets $ (Assets +HAZUS) x $1,000	# of Facilities Impacted (Assets + HAZUS)	Estimated Loss
Statewide Totals			$500,000
Coconino	Data Not Available	Data Not Available	$500,000

State of Arizona



Note: Information obtained through Natural Resource Conservation Service's Snotel network and utilized locational points of stations and data collected for recurrence interval depths. The snow contours shown hereon are for graphical purposes only and are not to be used as design parameters. 3 day, 100 year interval snowfall is defined as 1% chance in any given year that snow level will reach or exceed that particular level.

Source: NCDC, 1998; NRCS, 2004; JE Fuller, 2004; ALRIS, 2006; URS, 2003

Legend

- Major City
- interstate
- Highway
- Major Streams
- County
- Lakes
- Cities

N

0 25 50
Miles

August 2007

State of Arizona Multi-Hazard Mitigation Plan

Map 34
Winter Storm Areas
2004 Assessment

JE FULLER HYDROLOGY & GEOMORPHOLOGY INC.